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The Case Book of John Rowe, of London and Exeter, from 1775 to 1790. Edited from the original MS., with an Introductory Notice, by FREDERICK HENDRIKS, *Actuary to the Globe Insurance.*

INTRODUCTORY NOTICE.

JOHN ROWE was the author of an *Introduction to the Doctrine of Fluxions*, which reached its third edition in 1776. The work was then advertised with an extract of a letter to the author "from the learned and well known Reverend J. Stubbs, M.A., Fellow of Queen's College, Oxford," setting forth that he had received Rowe's valuable present, and was much surprised to find it so prodigiously improved. Indeed, it so much resembled a new work, when compared with the first edition, that he wished no mention had been made of its being the third, but that the two former editions should be left to be forgotten.

In 1766 Rowe was living in London, at No. 25, Throgmorton Street. About two years previously, a "Law Society for the Benefit of Widows" had been established. Its directors were the Lord Chancellor, three Judges, the Attorney-General and Solicitor-General, and fifteen other eminent men in the legal profession. This Society was not restricted to the metropolitan lawyers, but was extended by agency throughout the kingdom.

At a meeting of the directors in May, 1766, a reference was agreed to be made "to some gentlemen skilled in calculations of the kind," in order to obtain full satisfaction whether the premiums proposed in the rules would be sufficient to establish the Society on a lasting foundation. This reference appears to have been finally made to Rowe alone; and, under date 11th August, 1766, he reported that he was of opinion the Society would not be fixed on a permanent foundation if the annual premiums were less than those expressed in a table he calculated for the purpose and communicated with his report.

Rowe's Table, which gave the rates of annual premium for widows' annuities of £50, was based on Simpson's London Bills of Mortality, interest at 3 per cent. These rates were much higher than those stipulated in the rules of the Society. The consequence of this reference to Rowe was the dissolution of the "Law Society."

Rowe communicated to a newspaper called *The Gazetteer* the particulars of the reference, and his report thereon. This he intended as a warning to the insecure Insurance Associations of that

day. His letter was signed "Pro Bono Publico." It called forth rejoinders from other correspondents, some anonymous, whom he answered in five more letters. The opposite side of the question was chiefly taken up by friends of "The Laudable Society of Annuitants for the Benefit of Age," who wished to justify the proceedings of that Institution.

Mr. Benjamin Webb, a writing master and accountant, who had published a little work in 1762, entitled *The Complete Annuitant*, contributed some letters in support of Rowe's views as to the sandy foundations of the "Laudable Society." This "Laudable Society" was not the one referred to in Morgan's treatise, which was located in Bartholomew Lane, and obstinately maintained its delusive rates of premium. The Society in question in the pages of the *Gazetteer* was established at the King's Head Tavern in the Poultry, in 1766—was willing to amend its conditions, and did so, as is fully explained in the second volume of Dr. Price's work.

The "Equitable Society" deemed the controversy of sufficient importance to call for the insertion of a letter in the *Gazetteer*, signed, by order of the directors, John Edwards, Actuary, and dated from the house of the Society in St. Nicholas Lane, 22nd February, 1768.

Rowe soon after left London; and eight years afterwards—viz., in January, 1776—being then resident at Exeter, he republished the correspondence, by request, under the title of "*Letters relative to Societies for the Benefit of Widows and of Age*. Exeter. 8vo. pp. 38."

In the preface to this republication Rowe states, that at the time he quitted London, which was in May 1768, he did intend to write, at large, on the various Societies then subsisting for the benefit of widows and of age; but his very able friend, the Rev. Dr. Price, having copiously and with great judgment handled these subjects in his excellent treatise, first published in the year 1771, he therefore now declines his then general design.

The autograph Case Book of Rowe, containing the actuarial questions put to him and the answers given, between 1775 and 1790, has, it need scarcely be stated, never been printed, and it came into the possession of the writer of this notice as a document to which no importance had previously been attached. There are reasons, however, that give its contents considerable interest and value to modern students of the profession, from which Rowe, like De Moivre before him, derived a part, at least, of an honourable subsistence; and these reasons are an inducement to its being now edited in the pages of this periodical.

In fact, any documents showing, like those which will presently be submitted to the reader's notice, the practical working of financial problems, and the tables of mortality and rates of interest employed, in the calculations of the few but in many respects distinguished men who may be called the actuaries of the eighteenth century, deserve to be preserved as records of the gradual steps and progress made in a useful science. And although the name of Rowe neither has, nor merits, the same degree of distinction as that of De Moivre or of Simpson in the first half of that century, or of Tetens, Price, and Morgan in its other half, nevertheless a respectable share of honourable mention may, with much propriety, attach to it.

CASE BOOK OF JOHN ROWE (1775—1790.)

QUESTIONS PROPOSED TO, AND ANSWERS GIVEN BY, JOHN ROWE.

No. I.

From Messrs. WM. WILLIAMS & SON, July 14, 1775. (Fee, NS/B.)

"Mary, the wife of Wm. Thomas, a bankrupt, a healthy woman of 26 years of age, is intitled to a clear annuity of £8 a year (charged on a leasehold tenement) during the life of Margaret Jones, her mother, now aged upwards of 62 years; and, after the death of the said Margaret, to that tenement *for her life*, which is admitted to be of the clear yearly value of £25. The lives on the tenement are—Mary the annuitant, and John her brother, a healthy young man.

"You are desired to calculate the value of Mary's present annuity, and of her reversionary interest for her life in the tenement, deducting her present annuity."

ANSWER.—The whole is to find the value of the joint lives of Margaret and Mary, and the value of Mary's single life. For John's life, though it be of great importance to Margaret, is of no consequence to Mary; and the value of Mary's reversionary right is the difference of her life and the joint lives.

Now, the value of Mary's life is 15 years' purchase, and the value of the joint lives is $7\frac{3}{4}$ years' purchase. Hence,

The present value of Mary's £8 annuity is . .	$(£8 \times 7\frac{3}{4})$	£62
Do. do. reversionary right is $(£25 \times 7\frac{1}{4})$		181

So that the whole of Mary's interest in the tenement is	£243
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Interest of money I suppose to be 4 per cent.

JOHN ROWE.

July 17, 1775.

No. II.

From Mr. JOHN DENNIS, Dec. 15, 1775. (Fee, NS/B.)

“*Quære*, the value of two lives aged 39 and 37 years, in reversion of one aged 75, in an estate producing £22 per annum clear?”

ANSWER.—Interest being 4 per cent., the value of all the lives is $17\frac{1}{4}$ years’ purchase, and the value of the life in possession is $4\frac{1}{4}$ years’ purchase. Therefore, the value of the reversion is 13 years’ purchase, or 13 times £22—that is, £288.

J. R. Dec. 16, 1775.

No. III.

From MAJOR COLLINS, June 10, 1779.

“The present state of the present marine officers:—

“3 Colonels.

“6 Lieutenant-Colonels.

“6 Majors.

“125 Captains.

“250 1st Lieutenants. } Each subaltern is supposed to come into the
“250 2nd Lieutenants. } service from 15 to 20 years of age.

“Q. 1°—What chance does the youngest officer stand of being one of the 3 Colonels?*

“Q. 2°—And in what number of years?†

“Q. 3°—Likewise, how many years to a Company?‡

“Q. 4°—And, how many years to a Field Officer?§

“The enemy and various climates make vacancies: but the Field Officers never go to sea, only Captains and Lieutenants; and mostly Lieutenants, as the Captains are kept for recruiting.

“During a spirited war, and to the year 1771, only 5 Field Officers on the establishment were made.”

ANSWERS.—* About $\frac{1}{500}$.

† „ 60.

‡ „ 35.

§ „ 50.

J. R. June 17, 1779.

No. IV.

From Mr. GULLETT, June 19, 1779. (Fee, EN/S. 1 Guinea.)

“A B, aged about 27 years, son and heir apparent of C D, agrees to grant an annuity of £435 per annum to E F, aged also about 27 years, to take effect after the death of the said C D, who is stated to be about 69 or 70 years old—*provided* the said A B and E F should be *both* living at the death of C D, who is represented to be infirm and a bad life.

“Q.—How many years’ purchase is the said annuity worth, at a fair market price? And what ought E F to give for the same, under all the circumstances of risque? Interest of money, 5 per cent.”

ANSWER.—A solution of this problem is given by the late justly celebrated Mr. Simpson, in his *Select Exercises*, p. 302. His solution is general, and applicable to any tables of observation. I have applied it to

both London and country tables; and I find the *present* value of the annuity to be, by London tables, $5\frac{9}{10}$ years' purchase, or £2,566; and, by country tables, $7\frac{1}{2}$ years' purchase, or £3,132. How much *extra* the purchaser of the annuity in expectation ought to pay on account of C D's infirmity, comes not under calculation; but my opinion, on the whole, is, that the sum of £3,000 ought to be immediately paid to A B on his granting the annuity in question.

J. R. June 21, 1779.

"Mr. Gullett's compliments wait on Mr. Rowe, with a Case, to desire his solution of the mathematical question there stated, which is of very considerable moment to Mr. Gullett's clyent, and therefore Mr. Rowe will please to give it due attention, as at all events it will be laid before the Lord Chancellor, either with or in preference to Mr. Horsfall's.

"'Tis intended to be sent by Monday's post.

"Castle Street, 19 June, 1779."

No. V.

From the PRIEST VICARS, November 19, 1781. (Fee, NS/B.)

"An estate of £95 per annum gross rent (paying £5 high rent) is held upon three lives of the respective ages of 82, 53, 52. Now, it is required to exchange the life of 52 for one of 8 years. *Quære*, the value of the exchange?*

"Supposing the life of 82 to die, near at hand, and a life of 8 years to be added to those of 53 and 52; *quære*, the value of the purchase? †

"Clear produce, about £65. The estate is in fields."

ANSWER.—* $3\frac{1}{2}$ years' value, or £220.

† $4\frac{1}{2}$ years' value, or £290.

Interest, $4\frac{1}{2}$ per cent.

J. R. Nov. 20, 1781.

No. VI.

An estate, in fee, produces clear £600 a year; and is allowed to be worth 25 years' purchase, or £15,000.

It is devised thus—to A, aged 68, for life; and after her decease, to B, and his heirs for ever. But, out of it, B is to pay to C £4,000, and to D £800.

Quære, the present value of each person's interest in the said estate? Interest, 4 per cent.

	£.	
ANSWER.—A's . .	4,028	Mrs. Ellicombe.
B's . .	7,461	William.
C's . .	2,926	Hugh.
D's . .	585	Mrs. Young.

15,000

J. R. Dec. 7, 1781.

1857.]	<i>The Case Book of John Rowe.</i>					141
600	6·714	25—6 714=	18·286	18·286	4028	15,000
25	600		160	32	2925	7,538
					585	
15000	4028·400		1097160	36572		7,462
	A.		18286	54858	7538	B.
			2925·760	585·150		
			C.	D.		

N.B. A's equal chance of *living* or *dying* is eight years. That is, of 100 people now living, each aged 68, in eight years hence 50 will be living and 50 dead.

No. VII.

From Messrs. WM. WILLIAMS & SON, Nov. 29, 1781. (Fee, 1 Guinea.)

"R. W., aged 46, is seized of an estate for life in lands and hereditaments, agreed to be of the clear yearly value of £230, with remainder to his first and every other son in tail male; and E., the wife of the said R. W., who is now aged 41 years, is intitled to lands and hereditaments (agreed to be of the clear yearly value of £80) part of the above premises, for her life, for her jointure in case she survives her husband.

"The said R. W. and E. his wife have been married two years, but have no issue.

"E. B. is seized of the reversion in fee of these lands and hereditaments to her and her heirs for ever, expectant on the deaths of the said R. W. and E. his wife, and on failure of issue male by his present or any after-taken wife, and subject to a power of jointuring the said £80 a year on any after-taken wife.

"All the parties are now in good health.

"The said R. W. is willing and desirous to purchase of the said E. B. her reversion in fee expectant as aforesaid, at the *now* fair value of it.

"You are therefore desired to calculate and pronounce, according to your judgment, what the reversion of E. B. in these premises is now worth to a purchaser, subject to the aforesaid several interests of the said R. W. and E. his wife respectively hereinbefore stated."

ANSWER.—To determine the value of the reversion, it is necessary first to fix the value of the perpetuity—which, in my opinion, is 25 times the clear annual produce, viz., £230 multiplied by 25, or £5,750.

Now, R. W. and his wife are entitled, as long as *either* of them shall live, to £80 a year; and he to £150 a year more, during *his* life. The former is worth $15\frac{7}{10}$ years' purchase, that is, £1,256; and the latter, $12\frac{1}{2}$ years' purchase, that is, £1,818. Now, if we deduct these two sums out of the value of the perpetuity, there will remain £2,676; and this remainder would be the value of the reversion, if it were *certain* that R. W. would never be married again, and that at his death he would leave no issue *male*. But calculation does not extend to *these* contingencies, which, I think, greatly lessen the value of the reversion.

On the whole, I am of opinion that the present value of the reversion in question is £1,800.

Interest, 4 per cent.

J. R. Dec. 3, 1781.

No. VIII.

From GOVERNOR BRUTTON, *January 9, 1782.* (Fee, NS/B.)

"A, aged 40, stands engaged to pay an annuity of £70 during the lives of B and C, aged each 40. The said annuity is to cease either on the death of A, or the two deaths of B and C. A sum of money is talked of in lieu of the said annuity. *Quære*, what may it be worth?"

ANSWER.—The annuity is worth, more or less, according to the rate of interest, which I shall suppose to be 5 per cent. per annum.

Now, an annuity on three lives, each aged 40, to continue as long as either of them shall be in being, is worth $15\frac{4}{5}$ years' purchase—that is, £70 multiplied by $15\frac{4}{5}$, or £1,106; and the same on two lives is worth $14\frac{2}{3}$ years' purchase, or £1,026. The difference, viz., £80, is the present value of A's reversionary interest; and the present value of B's and C's possessionary interest is the difference between an annuity on A's life and his reversionary interest.

Now, an annuity on A's life is worth $11\frac{4}{5}$ years' purchase, or £826; and (his reversionary interest being £80) therefore £746 is the present value of B's and C's interest or right in the annuity in question.

(£600.)

J. R. *Jan. 14, 1782.*

No. IX.

From THE PRIEST VICARS, *April 23, 1782.*

"A house (built about 30 years) produces clear about £20 per annum. It is held on one life, aged 60. It is proposed to add two lives, aged 20 and 15.

"*Quære*, what ought to be paid for adding the said two lives?"

ANSWER. — The present value of the life (60) in possession is $7\frac{4}{5}$ years' purchase, and the present value of the three lives (60, 20, 15,) is 16 years' purchase. Therefore, if we subtract $7\frac{4}{5}$ from 16, the remainder, viz. $8\frac{1}{5}$, will be the number of years' purchase to be paid for adding the two lives in question—viz., £20 multiplied by $8\frac{1}{5}$, or £164.

Interest, 6 per cent.

J. R. *April 24, 1782.*

No. X.

From Mr. EDMUND GRANGER, *Aug. 30, 1782.* (Fees, NS/B+NS/B.)

"An estate is let to a tenant, at . . . £26 0 0 per annum.
The tenant pays for gates, bars, and stiles, about 1 0 0 ,,

£27 0 0

High rent £2 14 8

Poor rates, and all other disburse-
ments, exclusive of high rent,
but inclusive of gates, bars, and
stiles } 7 7 4

————— 10 2 0

Clear annual produce . . . £16 18 0

“ All disbursements, exclusive of high rent, were, in the

			£.	s.	d.
Year 1771	.	.	7	19	4
„ 1772	.	.	7	16	1
„ 1773	.	.	8	11	3
„ 1774	.	.	8	2	0
„ 1775	.	.	6	9	6
„ 1776	.	.	5	17	9
„ 1777	.	.	7	10	9
„ 1778	.	.	6	13	9
„ 1779	.	.	8	1	10
„ 1780	.	.	6	10	3
			£73 12 6		

“ Average, £7. 7s. 4d.

“ The estate is held on a life aged 50.

“ *Quære*, the present value of the said estate on the said life?”

ANSWER.—A life aged 50, supposing interest of money to be $4\frac{1}{2}$ per cent., is worth $10\frac{4}{5}$ years' purchase; and, on that supposition, my answer is, £16. 18s. multiplied by $10\frac{4}{5}$, that is £182.

J. R. Aug. 31, 1782.

No. XI. (Refers to No. X.)

To Mr. GRANGER—in answer to LORD ASHBURTON's Letter.

SIR,—I am well assured that no landed estate, consisting of fields, has of late been, or can now be, bought for less than $22\frac{2}{3}$ years' purchase—I mean, of the clear annual produce; and this is the same as the purchaser's making $4\frac{1}{2}$ per cent. interest.

A tenant will certainly give more for an estate when he can hold it for a term of years *absolute*, than when he must hold it on a *contingent* term. His Lordship, therefore, if he purchases, may let the estate at a higher rent.

Interest of money being $4\frac{1}{2}$ per cent., a life of 50 is worth $10\frac{4}{5}$ years' purchase.

Interest of money being 5 per cent., a life of 50 is worth $10\frac{1}{3}$ years' purchase.

Now, the difference between $10\frac{4}{5}$ and $10\frac{1}{3}$ is $\frac{7}{15}$; and $\frac{7}{15}$ of £16. 18s. being £7. 17s. 6d., or £8, if we subtract this difference from £182 there will remain £174; and this is the sum, I apprehend, that his Lordship means to give for your right in the estate.

Surely £8 can be of no consequence to either his Lordship or yourself.

I am, Sir, your obedient humble Servant,

J. R. Sept. 9, 1782.

P.S. If his Lordship shall raise the tenant £1 rent per annum (and that he may easily do, by making the term *absolute*), then the clear annual produce being £17. 18s., his Lordship, by paying you only £182, will make more than 5 per cent. interest—for £17. 18s., multiplied by $10\frac{1}{3}$, will produce £184. 19s. 4d.

Sure I am, that my friend Dr. Price, were he to be consulted, would join with me in opinion; and, I believe, my Lord Ashburton will not dispute his understanding the subject of annuities; nor, indeed, does his Lordship mine.

J. R.

No. XII.

From Mr. GILES PAINTER, March 6, 1783.

“Two people, aged 34 and 44, would lay out £1,000 for an annuity, to be paid as long as either of them shall be alive. *Quære*, what should the annuity be?”

ANSWER.—I suppose interest of money to be $4\frac{1}{2}$ per cent.; and, on that supposition, the two lives are worth $15\frac{1}{2}$ years' purchase; and therefore, if we divide £1,000 by $15\frac{1}{2}$, the quotient—viz., £64. 10s.—is my answer to the question.

J. R. *March 6, 1783.*

No. XIII.

From Messrs. WM. WILLIAMS & SON, April 16, 1783.

“An estate produces clear £18 per annum, held on two lives, each 46—a house and shammy yard. *Quære*, its value?”

ANSWER.—Two lives, each 46, are worth $13\frac{1}{4}$ years' purchase, or £248; but, as it ought not to be supposed always to be tenanted, I am of opinion that the present value of the estate is no more than $11\frac{1}{2}$ years' purchase, or £207.

J. R. *April 17, 1783.*

No. XIV.

From Mr. JOHN JONES, June 26, 1783. (Fee NS/B.)

“A holds an estate in Devonshire for a term whereof $37\frac{1}{2}$ years are yet to come, paying for the same a yearly rent of £100, out of which he is allowed by the landlord the land tax and repairs of walls, which together amount annually, upon an average, to £16. 16s. a year; so that the landlord now receives annually the clear sum of £83. 4s.

“The estate is worth £214 a year, subject to all outgoing (except tythes), which outgoing may be estimated at £44 a year: consequently, it will produce (if in hand) £170 a year clear to the landlord.

“The owner of the fee proposes to sell all his interest in the estate to A—viz., the rent reserved upon the lease, whereof $37\frac{1}{2}$ years are to come as above mentioned, and the reversion in fee expectant upon the expiration of the lease.

“*Quære*, what is it worth in ready money?”

ANSWER.—The value of the fee, in my opinion, is 25 years' purchase: I mean, 25 times the clear annual produce—viz., 25 times £170; that is, £4,250.

Now, the present value of the estate, held by A for $37\frac{1}{2}$ years, is $19\frac{1}{4}$ years' purchase, or $19\frac{1}{4}$ times £170—that is, £3,272. 10s.; out of which, if we deduct $19\frac{1}{4}$ times £83. 4s., viz., £1,601. 12s., there will remain £1,670. 18s., which is the present value of A's interest in the estate:

consequently, if we subtract A's interest from the fee—viz., £1,670. 18s. from £4,250, we shall have £2,579. 2s. for my answer to the question.

Interest, 4 per cent.

J. R. June 28, 1783.

No. XV.

From Messrs. WM. WILLIAMS & SON, May 19, 1785. (Fee, $\overline{N+R}$ B.)

"An estate held by Mr. Thos. Biss lets at £84, clears £62; $\frac{5}{12}$ ths of it held on two lives aged 30 and 40, and $\frac{7}{12}$ ths of it on the life aged 30. *Quære*, the value?"

ANSWER.—Suppose interest 5 per cent: then the two lives will be worth $15\frac{1}{2}$ years' purchase, and the life of 30 worth 13 years. Therefore, $\frac{5}{12}$ ths of £62—viz., £25. 16s. 8d., multiplied by $15\frac{1}{2}$, will give £400. 8s. 4d. for the two lives; and $\frac{7}{12}$ ths of £62—viz., £36. 3s. 4d., multiplied by 13—will give £470. 3s. 4d. for the life of 30.

Hence, £400 added to £470—viz., £870—is my answer.

P.S.—If interest be 4 per cent., then my answer is £955.

J. R. May 19, 1785.

No. XVI.

From the Rev. Mr. JAMES BRYATT, June 10, 1785. (Fee, $\overline{N+R}$ B.)

"An estate in fields, &c., produces clear £60 per annum; is held by A for his life, aged 50. Now B, aged 55, will purchase it for his life if A outlives him; but if he dies before A, then to revert to A. *Quære*, the value?"

ANSWER.—Interest being 5 per cent., A's life is worth $10\frac{1}{4}$ years' purchase, or £615; and the *joint* lives of A and B, $7\frac{1}{4}$ years' purchase, or £435. My answer, therefore, is £435.

J. R. June 10, 1785.

No. XVII.

From Mr. JAMES HINE, April 26, 1786. (Fee, 1 Guinea.)

"The clear yearly value of an estate held on the life of Mr. Wills, aged 50, is £10. 14s. 6d.: Mr. Granger the seller, Mr. Penson the buyer. *Quære*, the value or sum to be paid?"

ANSWER.—The estate in question is really worth £115; but as no man, I suppose, would give so much for an estate held on another man's life as he would if it were to be held on his own life—the lives being of equal value—I am of opinion that the sum to be paid by Mr. Penson to Mr. Granger should be £95.

Interest, $4\frac{1}{2}$ per cent.

J. R. April 27, 1786.

P.S.—Mr. Wills's equal chance of living or dying is 17 years; that is, of 100 persons now living, each 50 years of age, at the end of 17 years 50 will be dead and 50 living.

No. XVIII.

From the Rev. Mr. RICHARD HOLE, July 6, 1787. (Fee, 2 Guineas.)

"A freehold estate produces clear £500 per annum: A, aged 40, is in the possession of it, and is to hold it during his life, if B, aged 15, shall happen to die before he attains the age of 24. If B shall attain that age,

then A, if he be living, is to surrender it to B, who is then to enjoy it as long as he shall afterwards live. *Quare*, the present value of the reversion? Interest, 5 per cent. per annum."

ANSWER.—A's interest in the estate consists of two parts: one, on the contingency of *his* LIVING 9 years; the other, on the contingency of *B's* DYING before he attains the age of 24. The former is worth 6.406 years' purchase, or £3.203; and the latter, were it *certain* that at the end of 9 years B would be *dead*, would be worth 5.431 years' purchase, or £2,715. But the probability of his *dying* before he attains the age of 24 is $\frac{5.5}{6.28}$; therefore, if we multiply £2,715 by 55, and divide the product by 628, we shall have £237 for the value of the latter part: so that the present value of the whole of A's interest in the estate is £3,440.

Now, the value of B's interest in the estate is thus found—viz., find the value of a life aged 24; multiply the said value by the *present* value of £1 to be received at the end of 9 years; and multiply the product by the probability that A and B, at the end of 9 years, shall *both* of them be living. The product will be the value sought—viz., £3,193.

Now, the fee, or perpetuity, is worth 20 years' purchase, or £10,000; hence, if we deduct out of £10,000 A's and B's interests in the estate—viz., £3,440 and £3,193—we shall have £3,367, the present value of the reversion, the answer.

Note.—The probability of B's *living* 9 years is, by the *Breslaw* tables, $\frac{5.73}{6.28}$; which, subtracted from unity or 1, leaves $\frac{5.5}{6.28}$, the probability of his *dying* in 9 years—for it is *certain* that, at the end of 9 years, he must be either *alive* or *dead*. Unity, or 1, always expresses certainty.

The probability of A's *living* 9 years is $\frac{3.57}{4.45}$; and the probability that A and B, at the end of 9 years, will *both* of them be living, is $\frac{3.57}{4.45}$ multiplied by $\frac{5.73}{6.28}$ —viz., $\frac{3.24561}{2.79460}$.

A life aged 15 (interest being 5 per cent.) is worth 14.271 years' purchase, and a life aged 40 is worth 11.837 years' purchase.

The present value of £1 to be received at the end of 9 years is .6446, interest being 5 per cent.

J. R. July 9, 1787.

ST. COLUMB MAJOR, IN CORNWALL—10 miles from Bodmin, 15 from Truro, 4 from the sea.

* The reversion of the living, in my opinion, will sell for £2,500, or perhaps for £2,000.

☞ If A should happen to die before the expiration of 9 years, and B be living; and if C shall have a power to hold the living till B shall be qualified to take possession, then the value of the reversion will be *lessened* £502.

J. R. July 11, 1787.

* Sold for £2,200.

NO. XIX.

From Messrs. WM. WILLIAMS & SON, Dec. 12, 1787. (Fee, NS/B.)

"A, who is now aged 6 years, is entitled to an estate of £50 per annum in fee (which is supposed to net $\frac{3}{4}$ of the gross rent) if he lives to attain 21 years; but if he dies under 21, the estate is lost to his family, and goes to B in fee.

"It is agreed the estate is worth, at a clear rent, 27½ years' purchase.

"A's father would purchase the reversionary interest in this estate for the benefit of himself and family, or rather the contingent interest of B.

"You are desired to say what, in your judgment, the value of the reversionary (or rather, contingent) interest is in this property."

ANSWER.—The clear produce of the estate is £37. 10s. per annum, and interest of money $3\frac{5}{8}$ per cent. per data.

A general answer to the question may be seen in the celebrated Mr. Simpson's *Select Exercises*, p. 296; and which, applied to this particular case, gives £160, my answer.

J. R. Dec. 14, 1787.

No. XX.

Rev. Mr. HOLE, Jan. 19.—Ans. Jan. 21, 1789.

"1st. A gentleman advances £1,000. He is 78 years old. *Quære*, what annuity ought he to have for it, for his life?"

ANSWER.—Interest 5 per cent., £329; 4 per cent., £325. But my answer is, £275, or £250.

"2nd. To be sold, a reversion of £500, after the death of two lives, aged 47 and 64."

Interest 5 per cent., it is worth £194; 4 per cent., £229. But I am of opinion no one will give more than £170 or £180.

Received, a fee, 1 guinea, Jan. 21.

J. R.

No. XXI.

From Mr. LEY, June 9, 1789.

"An estate produces clear £30 per annum; is held on 3 lives, aged 19, 22, and 60. The holder would exchange the lives 19 and 60 for two other lives, aged 42 each. *Quære*, the difference?"

ANSWER.—Three lives, aged 19, 22, and 60, are worth 17 years' purchase; and three lives, aged 22, 42, and 42, are worth $16\frac{2}{3}$ years' purchase. Therefore, the *difference* or *loss* to the person who desires to make the exchange is $\frac{2}{3}$ ths of a year's purchase—that is, £12.

My usual fee is 1 guinea.

J. R. June 10, 1789.

No. XXII.

From Messrs. STOODLY & SHORT, April 8, 1790. (Fee, 1 Guinea.)

"A perpetual advowson, expectant on the death of the present incumbent, 80 years of age:—

"The glebe, per annum	£50	0	0
Tithe, per annum	84	0	0
Land tax, per annum	£8	9	0
Poor rates for 5 years, on an average	3	15	2
		12	4
		2	
	£111	15	10
Deduct, per annum, for a curate	40	0	0
	£71	15	10

"The parsonage house is a very good one, and in very good repair, and in a most excellent neighbourhood; the living is valued in the King's books at £5. 1s. 3d., consequently tenable with any other living. *Quære*, the real value, under the above circumstances, of the above advowson?"

			£71	15	10
Deduct yearly tenths	.	.	.	0	10
				1	
			£71	5	9

ANSWER.—I suppose interest of money to be 4 per cent. I am of opinion that the real value of the living, if it were to be taken into immediate possession, is two thirds of 25 times £71. 5s. 9d., viz., £1,188. 2s. 6d. The life of the present incumbent is worth two years' purchase, that is, £142. 11s. 6d.; two thirds of which, viz., £95. 1s., being deducted out of £1,188. 2s. 6d., will leave £1,096. 17s. 6d., or £1,100, for my answer to the question.

J. R. April 10, 1790.

* * It is not improbable but it may sell for £1,200.

* * It is evident a mistake of £10 is in the statement. If the £111. 15s. 10d. should be £121. 15s. 10d., then my answer to the question, instead of £1,100, is £1,250.

$\frac{2}{3}$ of 25 = $16\frac{2}{3}$	£.	s.	d.
$\frac{2}{3}$ of 2 = $1\frac{1}{3}$	1,096	17	6
	153	6	8
	15 $\frac{1}{3}$		
15 $\frac{1}{3}$ times £10 = £153. 6s 8d.	£1,250	4	2

J. R. April, 10, 1790.

* * It should be £81. 15s. 10d. 15 $\frac{1}{3}$ times £81. 15s. 10d. = £1,254. 2s. 10d. My answer to the question, therefore, is £1,250

J. R. April 10, 1790.

* * Yearly tenths, 10s. 1 $\frac{1}{2}$ d. 15 $\frac{1}{3}$ times 10s. 1 $\frac{1}{2}$ d. = £7. 15s. 3d. J. R.

Inquiry into the Average Longevity of Vegetarians, compared with that of Persons who live on a Mixed Diet. By DR. T. FORSTER, M.B., F.R.A. & L.S.

AMONG the many curious facts relative to the duration of human life which have resulted from the persevering inquiries of persons interested in Life Assurance Offices, one very essential question appears to me to have been left undecided—namely, whether, and in what degree, a diet of vegetable food alone increases the length of life. The Vegetarian Society of Manchester pretend, not only that pure vegetable diet renders man almost exempt from many of the most fatal complaints to which we are subject, but also, that it has actually prolonged the average duration of human life. To this question I beg leave to call the attention of your readers: I should like to see it fully investigated and developed. My attention has been directed to the effects of different sorts of food on different kinds of constitution for many years past, and the conclusion to which I have come is certainly in the highest degree favourable to